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ABSTRACT

The unibody construction and frame alignment course is designed as one of a group of quinmester courses offered in the field of automotive body repair and refinishing. General information will be provided for the student along with technical knowledge, basic skills, attitudes and values that are required for entry level auto body helpers. The nine week (135 clock hours) course is designed to familiarize the student with the basic concepts of unibody construction and frame alignment. Instruction will consist of demonstrations, lectures, group discussions, audiovisual aids and resource people from industry. A course outline is provided with four pages of post tests. (DS)

ED 092702

AUTHORIZED COURSE OF INSTRUCTION FOR THE QUINMESTER PROGRAM

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Course Outline
AUTOMOTIVE BODY REPAIR AND REFINISHING 3 - 9037
(Unibody Construction and Frame Alignment)
Department 48 - Quin 9037.01

CE 001 131

DADE COUNTY PUBLIC SCHOOLS
DIVISION OF INSTRUCTION • 1973

ED 092702

DADE COUNTY PUBLIC SCHOOLS
1450 NORTHEAST SECOND AVENUE
MIAMI, FLORIDA 33132

Course Outline

AUTOMOTIVE BODY REPAIR AND REFINISHING 3 - 9037
(Unibody Construction and Frame Alignment)

Department 48 - Quin 9037.01

county office of
VOCATIONAL AND ADULT EDUCATION

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Dr. E. L. Whigham, Superintendent of Schools
Dade County Public Schools
Miami, Florida 33132

January, 1973

Published by the School Board of Dade County

COURSE DESCRIPTION

9037	48	9037.01	UNIBODY CONSTRUCTION & FRAME ALIGNMENT
State Category Number	County Dept. Number	County Course Number	Course Title

This quinmester course is designed as one of a group of quinmester courses offered in the field of automotive body repair and refinishing. The student will receive the general information, technical knowledge, basic skills, attitudes and values that are required for entry level as auto body helpers. The main objective of this course is to familiarize the student with the basic concepts of unibody construction and frame alignment. This course will be given in a 9-week period.

Indicators of success: The applicant must demonstrate an eighth grade equivalency score in reading and math, and also have average ability in mechanical aptitudes.

Clock hours: 135

PREFACE

This quinmester course outline is a guide to help students become employable with skills, knowledge, attitudes and values necessary for performing the required service of the unibody and frame alignment repair mechanic. It is designed as a foundation quinmester course for the auto body mechanics trainee.

This outline consists of four blocks of instruction which are subdivided into several units each. It is one part of a series of outlines designed for the complete auto body mechanic. This course is 135 hours in length.

Indicators of success for this course are as follows: The student must have an eighth grade equivalency score in reading comprehension, arithmetic fundamentals and mechanical aptitudes. The student must be physically and mentally able to profit from this training.

Instruction consists of demonstrations, lectures, group discussion, audio visual aids and resource people from industry. Instructions will be flexible to meet individual needs and abilities.

The bibliography which appears on the last page of this outline lists several basic references along with supplementary references and audio visual aids.

This outline was developed through the cooperative efforts of the instructional and supervisory personnel, the Quinmester Advisory Committee, and the Vocational Curriculum Materials Service, and has been approved by the Dade County Vocational Curriculum Committee.

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with Suggested Hourly Breakdown

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GOALS

The automotive body mechanic trainee must be able to demonstrate:

1. An understanding of school and laboratory rules and policies.
2. Observance of safety rules and work habits.
3. The ability to select and use tools and equipment in his job performance.
4. The ability to perform the skills of the unibody and frame mechanic.
5. Pride and respect for craftsmanship in this occupational field.
6. Positive attitude regarding the value and dignity of work.
7. An incentive to continue with more advanced training within this occupational field.

SPECIFIC BLOCK OBJECTIVES

BLOCK I - ORIENTATION

The student must be able to:

1. List the opportunities that are available for a career in the auto body industry.
2. State orally or in writing what will be expected of him as an auto body frame mechanic.
3. Demonstrate skills and knowledge which will prepare him for a safe working life by actual shop assignments.
4. Demonstrate an understanding of shop organization, safety rules and regulations by observance and performance.
5. Exhibit pride and respect for craftsmanship by his actions in shop or laboratory.
6. Demonstrate understanding and acceptance of his duties and responsibilities by his performance in shop or laboratory.

BLOCK II - SERVICE TOOLS AND BENCH SKILLS

The student must be able to:

1. Define the general types of tools and use by selection and identification test.
2. Exhibit the ability to use the applicable tools and bench skills by selection and use.
3. Demonstrate proper care and maintenance of tools and equipment.
4. Exhibit the ability to practice safety precautions in the use of tools and equipment by observance and practice of shop rules.

BLOCK III - UNIBODY CONSTRUCTION AND FRAME ALIGNMENT

The student must be able to:

1. Exhibit the ability to identify types of conventional automobile frames by study of text and frame manuals.
2. Demonstrate an understanding of types of frame construction by written or oral test.
3. Explain in writing types of frame reinforcement and function.
4. Define methods of frame construction and function by oral or written test.
5. Exhibit the ability to define types and materials which make up the assembly of the unitized body and frame by written assignment.
6. Demonstrate an understanding of the manufacturing and assembly methods of the unitized body and frame by written assignment.
7. List the effects of frame misalignment as a result of collision.
8. Diagnose frame damage using required equipment.
9. Write a paragraph explaining the types of damage as a result of collision.
10. Explain the advantage and disadvantage of the stationary frame rack versus the portable single beam frame machine by written essay test.

11. Demonstrate an understanding of frame equipment and accessories his selection and use.
12. Demonstrate an understanding of using portable frame machine by actual job performance.
13. Demonstrate an understanding of using stationary frame machine by actual job performance.
14. Exhibit the ability to apply heat by his selection and use of equipment.
15. Demonstrate an understanding of the correct measuring devices to recheck frame alignment after completion of repairs by his selection and use of equipment.

BLOCK IV - QUINMESTER POST TEST

The student must be able to:

1. Complete the quinmester post-test by written assignment.

Course Outline

AUTOMOTIVE BODY REPAIR AND REFINISHING 3 - 9037
(Unibody Construction and Frame Alignment)

Department 48 - Quin 9037.01

I. ORIENTATION

A. Objectives of Course
   1. Standards
   2. Methods of evaluation
      a. Oral test
      b. Written test
      c. Manipulation
      d. Diagnosis and job performance
      e. Teaching methods

B. Student Benefits
   1. Opportunity of employment
      a. Scope of trade
      b. Job opportunities
   2. Qualifications for employment
      a. Attitudes
      b. Dependability
      c. Job competency
      d. Experience
      e. Pride of workmanship
      f. Foundation for more education and learning

C. Student Responsibilities
   1. School regulations
   2. School policies and expenses
   3. Shop rules and procedures
      a. Use and care of equipment
      b. Care of hand tools
      c. Materials and supplies
      d. Appropriate dress
      e. Reporting loss of equipment
      f. Reporting defective equipment
      g. Housekeeping
      h. Employee-employer relations
      i. Employee-customer relations
      j. Safety precautions

II. SERVICE TOOLS AND BENCH SKILLS

A. Automotive Hand Tools
   1. Types and sizes
   2. Uses and safety practices
      a. Removing and replacing
      b. Drilling
      c. Threading
      d. Tapping
      e. Aligning

II. SERVICE TOOLS AND BENCH SKILLS (Contd.)

f. Adjusting
g. Power tools
h. Lifting devices
i. Vises and clamps
j. Straightening devices

B. Measuring Devices
1. Steel tape
2. Tram gauge
3. Centerline gauge
a. Numerical measurements
b. Comparative measurements

C. Welding and Cutting Devices
1. Oxy-acetylene devices
2. Electric arc welder
a. Welding
b. Cutting
c. Heating
d. Brazing

D. Grinding and Sanding Devices
1. Portable
2. Stationary
a. Grinding
b. Sanding
c. Sharpening

III. UNIBODY CONSTRUCTION AND FRAME ALIGNMENT

A. Conventional Frame Construction
1. Types of frames
a. History and development
b. Ladder
c. Hour glass
d. Perimeter
e. Offset
2. Types of construction
a. Angle
b. U channel
c. Box
d. Tubing
e. Z stock
f. I beam
3. Frame reinforcement
a. Support cross members
b. X cross members
4. Frame construction assembly
a. Welded
b. Bolted
c. Riveted

III. UNIBODY CONSTRUCTION AND FRAME ALIGNMENT (Contd.)

B. Unitized Frame and Body Construction
   1. Construction materials
      a. Steel
      b. Aluminum
   2. Types of construction
      a. Angle
      b. U channel
      c. Box
      d. Z stock
      e. Tubing
      f. Panels
   3. Manufacturing methods
      a. Pressed
      b. Drawn
      c. Stamped
      d. Molded
   4. Assembly methods
      a. Electric spot weld
      b. Electric arc weld
      c. Oxy-acetylene gas weld
      d. Bolted

C. Frame Repairs and Alignment
   1. Effects of frame misalignment
      a. Misalignment of chassis sheet metal
      b. Misalignment of body, doors and rear compartment cover
      c. Misalignment of front suspension
      d. Misalignment of motor and transmission
      e. Misalignment of rear suspension
   2. Diagnosing frame damage
      a. Visual inspection
      b. Use of center line gauges
      c. Use of tram gauge
      d. Use of steel measuring tape
      e. Use of datum line gauges
      f. Frame chart
   3. Types of damage
      a. Sag
      b. Sway
      c. Buckle
      d. Diamond
      e. Twist

D. Types of Frame and Body Equipment
   1. Stationary (drive on)
      a. Pit mounted
      b. Elevated
   2. Portable single beam
      a. Push or pull
      b. Pull only
      c. Manufacturer

III. UNIBODY CONSTRUCTION AND FRAME ALIGNMENT (Contd.)

E. Equipment for Body and Frame Repairs
   1. Frame machine
      a. Stationary
      b. Portable
   2. Accessories
      a. Chains
      b. Oxy-acetylene torch
      c. Hammers
      d. Hydraulic jacks
      e. Jack stands
      f. Assorted wrenches
      g. Measuring devices
      h. Rocker panel anchor clamps (for unitized body)

F. Straighten Frame (Portable Machine)
   1. Types of damage
      a. Side sway
      b. Sag
      c. Twist
      d. Diamond
      e. Buckle
   2. Types of hook up
      a. Forward pull
      b. Diagonal pull
      c. Bow and arrow pull
      d. Up or down push or pull

G. Straighten Frame (Stationary Frame Machine)
   1. Types of damage
      a. Side sway
      b. Sag
      c. Twist
      d. Diamond
      e. Buckle
   2. Types of hook up
      a. Forward pull
      b. Diagonal pull
      c. Side pull
      d. Up or down push or pull

H. Use and Application of Heat
   1. Oxy-acetylene welding torch
      a. Safety precautions
      b. Selection of welding or heating tip
      c. Selection of protective devices
   2. Application of heat
      a. Correct flame setting
      b. Correct heat range

III. UNIBODY CONSTRUCTION AND FRAME ALIGNMENT (Contd.)

3. Purpose of using heat
   a. Relieve stress or strain
   b. Shrinking stretched metal
   c. Relieve work hardened metal
   d. Relieve compressed metal

I. Rechecking Frame After Straightening
   1. Measuring devices
      a. Tram gauge
      b. Center line gauges
      c. Steel measuring tape
      d. Datum line gauge
      e. Factory frame chart
   2. Critical check list
      a. Center line
      b. Datum line
      c. Wheel base
      d. Diamond condition
      e. Front suspension alignment

IV. QUINMESTER POST TEST

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1. Frazee, Irving, Bedel, Earl L., Spicer, Edward. Automotive Collision Work. Chicago: American Technical Society, 1953. Pp. 262.

2. Tobolt, Bill. Auto Body Repairing and Repainting. Homewood, Ill: The Goodheart-Wilcox Co., Inc., 1965. Pp. 7.

3. Venck, Ernest, Spicer, Edward, Davis, Ewart J. Automotive Collision Work, Chicago: American Technical Society, 1964. Pp. 275.

Supplementary References:

4. 1969 Fisher Body Service Manual. General Motors Corp., August, 1968.

5. 1971 Car Shop Manual. Dearborn, Michigan: Marketing Corp., 1970.

6. Motors Crash Estimating Guide. New York City: The Hearst Corp.

Films:		Dade County Number
1.	ABC of Hand Tools, Part I. 16mm. 18 min. Color. Sound. General Motors.	1-11397
2.	ABC of Hand Tools, Part II. 16mm. 16 min. Color. Sound. General Motors.	1-11339
3.	I Want A Job. 16mm. 26 min. B/W. Sound. Ford Motor Co.	1-11568

A P P E N D I X

Quinmester Post-Test Sample

QUINMESTER POST-TEST

NAME_____ DATE_____ SCORE_____

The following items are multiple choice. Select the number you believe correct.

1. The size wrench used on a 5/16" bolt is:

   a. ¼"
   b. 9/16"
   c. ½"
   d. 5/8"

2. The size wrench used on a ½" bolt is:

   a. 3/4"
   b. 13/16"
   c. 7/16"
   d. 9/16"

3. The size wrench used on a 3/8" bolt is:

   a. 7/8"
   b. 9/16"
   c. 7/16"
   d. ½"

4. Sheet metal screws are used extensively in the assembling of automobile bodies. The type must commonly used is the:

   a. Pan head
   b. Allen head
   c. Phillips head
   d. Clutch head

5. Of the following size Phillips screw drivers, the one used most is:

   a. No. 1
   b. No. 2
   c. No. 3
   d. No. 4

6. The type socket used on a square nut is:

   a. 12 point
   b. 8 point
   c. 6 point
   d. none of above

7. An impact wrench is used for:

   a. drilling
   b. reaming
   c. removing and replacing bolts
   d. all of above

8. A die is used to:

   a. cut threads in a hole
   b. straighten metal
   c. cut threads on rod or pipe
   d. ream hole

9. Pliers are used to:

   a. hold
   b. tighten
   c. loosen
   d. all of above

10. Hack saws are used to:

   a. cut sheet metal
   b. cut bolts
   c. cut fiber glass
   d. all of above

11. A tap is used to:

   a. screw on bolts
   b. cut threads on rod or pipe
   c. cut threads in hole
   d. cut sheet metal

12. A steel tape is graduated in:

   a. 5/16"
   b. 3/16"
   c. 1/16"
   d. all of above

13. A tram gauge is used to measure close tolerance such as:

   a. .010
   b. .050
   c. .080
   d. or comparative measurements

14. A vise is used to:

a. hold
b. squeeze
c. press
d. all of above

15. A floor jack is used to:

a. lift
b. squeeze
c. press
d. none of above

16. Center line gauges are used to:

a. check front suspension alignment
b. make diagonal check of frame
c. check frame center alignment
d. check frame datum line

17. The type of frame most apt to diamond from front or rear end collision is:

a. X frame
b. ladder
c. perimeter
d. hour glass

18. The automobile body is mounted on the chassis of conventional models and secured by:

a. rivets
b. welded
c. bolts
d. sheet metal screws

19. The automobile body is insulated at attachment points to frame by:

a. steel washers
b. rubber mounts
c. fiber glass mounts
c. plastic mounts

20. Conventional automobile frames are mounted and assembled at the factory on a:

a. die
b. jig
c. automobile body
d. flat steel plate

21. The type of material from which the automobile frame is constructed is:

a. U channel
b. box
c. angle
d. all of above

22. When applying heat to damaged area of frame, the color range should be:

a. cherry red
b. white
c. blue
d. salmon pink

23. The purpose of using heat to damaged area of frame is to:

a. relieve work hardening
b. shrink stretched metal
c. relieve compressed metal
d. all of above

24. Because the unitized body and frame is welded together as a unit it is:

a. easier to repair
b. much more difficult to repair
c. no more difficult than separate frame and body
d. none of the above

25. A frame that has been improperly repaired can cause wear to:

a. tires
b. transmission
c. universal joints
d. all of above

26. When rechecking repaired frame the critical points to check are:

a. centerline
b. datum line
c. front suspension alignment
d. all of above

QUINMESTER POST-TEST ANSWER KEY

1. c
2. c
3. b
4. c
5. b
6. b
7. c
8. c
9. d
10. d
11. c
12. d
13. d
14. d
15. a
16. c
17. b
18. c
19. b
20. b
21. d
22. a
23. d
24. b
25. d
26. d